

U.S. Patent Application No. 10/042,549
Amendment dated April 22, 2005
Reply to Office Action of January 25, 2005

REMARKS/ARGUMENTS

This Amendment is in response to the Office Action dated January 25, 2005 in the above-identified application. In the Office Action, claims 2 - 35 and 37 - 94 were rejected. Reconsideration and continued examination of the above-identified application are respectfully requested.

The amendment to the claims is editorial in nature and/or better defines what applicants regard as the invention. In particular, the Examiner at page 5 of the Office Action alleged that the specification does not provide a definition of a tantalum billet with a substantially uniform average grain size. In response, and in conformity to the description on pages 4 - 5 of the specification, claims 2 and 37 are amended to recite a substantially uniform grain size instead of a substantially uniform average grain size. Dependent claims 2 - 6 and 38 - 41 are amended so that they contain antecedent basis for their recitation of an average grain size.

Full support for the amendments can be found in the present application, including, for example, the first paragraph at page 10 and on pages 4 - 5. Accordingly, no questions of new matter should arise and entry of this amendment is respectfully requested.

Rejection of Claims 2 - 4, 16, 17, 71 - 73, and 89 - 90 under 35 U.S.C. §103(a) over Clark et al. and WO 87/07650 (WO '650)

Claims 2 - 4, 16 - 17, 71 - 73, and 89 - 90 were rejected under 35 U.S.C. §103(a) as being obvious over Clark et al., "Influence of Transverse Rolling on the Microstructural and Textural Development of Pure Tantalum," in view of WO 87/07650 (WO '650). The Examiner referred to the previous final Office Action wherein the Examiner alleged that Clark et al. teaches an extruded tantalum billet having a substantially uniform grain size. The Examiner acknowledged

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that Clark et al. does not explicitly teach the claimed purity, the metal in the article, the sputtering target or resistive film layer, but alleged that WO '650 teaches the purity claimed in claims 2, 7, and 12 and the metal in a sputtering target and a resistive film layer. The Examiner further alleged that WO '650 teaches that the use of highly pure tantalum in the formation of the target results in a high-quality oxide insulating film and metallic tantalum electrode film. The Examiner took the position that it would have been obvious to use the high purity tantalum material of WO '650 in the process of Clark et al. in order to provide Clark et al. with the desirable result of providing a material that, when formed into a tantalum sputtering target as taught in WO '650, yields a high quality oxide insulating film and metallic tantalum electrode film. In the present Office Action, with respect to amended claim 2, the Examiner alleged that Clark et al. teaches that the tantalum ingot is extruded and annealed. The Examiner takes the position that since annealing is not a thermomechanical process, the extruded and annealed tantalum of Clark et al. meets the limitation of having "a substantially uniform average grain size after extrusion and before any further thermomechanical processing."

For the following reasons, this rejection is respectfully traversed as it may be applied to the amended claims presented herein.

In the present invention, as described on page 10, lines 6 - 9 of the present specification, a substantially uniform grain size of a billet is achieved through the extrusion processing by itself and before any further processing. As discussed in Applicant's previous response, Clark et al. only provides grain information for an extruded tantalum part after it has been cold rolled and annealed. The subsequent steps set forth in Clark et al., including the cold rolling and annealing, would greatly affect the properties of the rolling bar and in fact, the publication is specifically directed to determining the effect of the process of various types of rolling on microstructure and

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texture. There is no information provided in Clark et al. with respect to grain size or other properties of a tantalum billet after it has been extruded and before any subsequent processing. Thus, the Examiner's assertion that Clark et al. shows a tantalum ingot that is extruded and annealed and that annealing is not a thermomechanical process is not understood. The Examiner further asserts that Clark et al. does not teach that the grain size of the extruded and annealed tantalum is not substantially uniform. Again, this statement is not understood. The Examiner cannot refer to a reference and assert that since Clark et al. does not mention that the extruded tantalum does not have substantial uniformity with respect to grain size, this must mean that it does have substantial uniformity. This type of negative teaching in the absence of a specific teaching is not acceptable under PTO guidelines. A reference must be relied on for what it clearly teaches or suggests. In the absence of any teaching or suggestion, the Examiner cannot speculate or assert that in the absence of a specific teaching, the reference must teach the opposite. The Examiner is respectfully requested to provide PTO guidelines that would support such an interpretation of cited art in a rejection. Clearly, and the Examiner does not seem to dispute this point, Clark et al. does not literally teach or literally suggest that the extruded tantalum, prior to any thermomechanical processing, has a substantially uniform grain size in the extruded tantalum. Furthermore, the Examiner does not seem to dispute that Clark et al. does not literally teach or literally suggest only extruding tantalum and determining grain size. It is clear from process 3 of Clark et al., which is the only process that shows extrusion, that the tantalum is extruded, annealed, and then subjected to rolling and cross rolling. It appears the Examiner does not dispute this point either. Thus, the Examiner's argument that Clark et al. somehow teaches or somehow suggests that Clark et al. achieves uniform grain size after only extruding and prior to any thermomechanical processing, such as rolling, is not understood. Clearly, rolling and cross

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rolling will clearly be a thermomechanical step and this is clearly shown prior to any measurement of grain size by Clark et al. It is quite clear that in each of the processes done by Clark et al., rolling and cross rolling were done thereby showing the significant importance of this subsequent thermomechanical processing by Clark et al. Moreover, even after the processes of cold rolling and annealing in Clark et al., it is not seen where Clark et al. teaches or suggests a substantially uniform grain size, even in the passages cited by the Examiner as allegedly containing this teaching. In particular, the studies of Clark et al. are primarily related to the texture of the tantalum, which is related to crystal structure orientation, or to grain size itself and not to uniformity of grain size. Moreover, Clark et al. does not contain any teaching that a substantially uniform grain size is a desirable trait. Accordingly, Clark et al. does not teach or suggest an extruded tantalum billet that has the property of having a substantially uniform grain size after extrusion and before any further processing, as required by amended independent claim 2.

WO '650 (abstract) was applied by the Examiner as allegedly teaching a purity of tantalum metal and the use of the tantalum metal in a sputtering target and a resistive film layer. WO '650 contains no teaching or suggestion with respect to grain size uniformity. Accordingly, the combination of Clark et al. and WO '650 does not teach or suggest an extruded tantalum billet that has the property of having a substantially uniform grain size after extrusion and before any thermomechanical processing, as required by amended independent claim 2. Moreover, the Examiner has not provided any proper motivation for making this combination. In particular, the Examiner has not provided any motivation for using tantalum that has a purity of at least about 99.99% in the method of Clark et al. Clark et al. does not specify any particular end use for tantalum that has undergone its rolling and recrystallization processes, but compares its processes

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and results to similar studies that are carried out with deep-drawing steel (page 2183, first column, first full paragraph and page 2190, second column, first full paragraph). Accordingly, it is reasonable to conclude that Clark et al. contemplates similar uses for its tantalum to the uses of deep-drawing steel, such as mechanical or structural uses, and that it is on this basis that the properties such as texture are being studied. There is nothing in Clark et al. that would teach or suggest any advantage of a tantalum having a purity greater than the standard commercial-grade high-purity tantalum used in the studies of Clark et al. Therefore, there is no motivation to use tantalum that has a purity of at least about 99.99% in the method of Clark et al. Also, it is far more difficult to obtain uniformity with high purity metals since the impurities in metal act as grain refiners. Clark et al. did not face this problem; the present invention, however, does. Moreover, there is no motivation to subject the material of WO '650 to the processes described in Clark et al., since there is no teaching or suggestion whatsoever that the process of extruding tantalum accomplishes any result, with respect to the properties of the tantalum, that has any relevance to the usefulness of the tantalum as a sputtering target. In particular, with respect to the Examiner's comments at page 5 of the present Office Action that there is motivation to combine WO '650 with Clark et al. by WO '650 in its abstract (i.e. to form a tantalum sputtering target yielding a high quality insulating film and metallic Ta electrode film), there is absolutely nothing in Clark et al. that makes any connection whatsoever to the physical properties obtained in its studies with respect to rolled plates and any physical property that would be relevant to obtaining high quality films by sputtering. In other words, a person skilled in the art seeking to make high quality Ta₂O₅ insulating film and metallic Ta electrode film by sputtering would not find any relevant teachings in Clark et al. and would not find motivation to combine the teachings of WO '650 with the teachings of Clark et al.

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Accordingly, claims 2 - 4, 16, 17, 71 - 73, and 89 - 90 would not have been obvious over Clark et al. and WO '650. Withdrawal of the rejection of claims 2 - 14, 16, 17, 71 - 73, and 89 - 90 is therefore respectfully requested.

Rejection of Claims 18 - 35, 74 - 79, and 91 under 35 U.S.C. §103(a) over Clark et al. and WO 87/07650 (WO '650) in further view of Friedman

Claims 18 - 35, 74 - 79, and 91 were rejected under 35 U.S.C. §103(a) as being obvious over Clark et al. and WO '650 in further view of Friedman et al. (U.S. Patent No. 5,482,672). The Examiner referred to the previous final Office Action in which the Examiner stated that Clark et al. and WO '650 are applied as discussed above, and acknowledged that these references do not explicitly teach the particular extrusion conditions. The Examiner alleged that Friedman et al. teaches the extrusion of tantalum and niobium ingots, including the temperature of extrusion, the coating of the material and the removal of the coating and that the reference teaches that extrusion is advantageous to make bars, rods and tubes out of difficult to make metals such as tantalum and niobium. The Examiner took the position that it would have been obvious to use the particular processing conditions of Friedman et al. to provide rods, bars and tubes of tantalum or niobium. The Examiner further alleged that regarding recrystallization, Friedman et al. teaches the same process steps and that therefore, one would expect the products resulting from the process taught by the reference to be the same as the products from the claimed process. For the following reasons, this rejection is respectfully traversed.

Dependent claim 18 of the present invention relates to a process for making the extruded tantalum billet of claim 2 by extruding a tantalum ingot at a sufficient temperature and for a sufficient time to at least partially recrystallize the tantalum billet during extrusion. As noted

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above, the billet of claim 2 is an extruded tantalum billet wherein the tantalum has a purity of at least about 99.99% and that has the property of having a substantially uniform grain size after extrusion and before any further thermomechanical processing.

As discussed above, the combination of Clark et al. and WO '650 does not teach or suggest an extruded ingot-derived tantalum billet wherein the extruded tantalum billet wherein the tantalum has a purity of at least about 99.99% and that has the property of having a substantially uniform grain size after extrusion and before any further thermomechanical processing.

Friedman et al. relates to a process for extruding a tantalum or niobium billet that has been formed by cold isostatically pressing powdered tantalum or niobium. Any reference to extruding solid metal in Friedman et al. is limited to the background section of the reference, and there is no teaching or suggestion in Friedman et al. that the particular processing steps and conditions that are described for extruding powdered tantalum or niobium are applicable to extruding an ingot-derived metal. An ingot-derived (i.e., melted) metal is quite different from a powder metallurgy product. One cannot substitute the two products. Accordingly, since Friedman et al. teaches its particular process steps and conditions only with respect to a powdered tantalum or niobium and not with respect to a solid ingot-derived billet, the Examiner's allegation that one would expect the products resulting from the process taught by the reference to be the same as the products from the claimed process is clearly erroneous.

At page 6 of the present Office Action, the Examiner noted that any part of Friedman et al., including the background, can be used in forming claim rejections and further alleged that since Friedman et al., at col. 1, lines 19-20 and lines 41-44 teaches the extrusion of tantalum ingot as an alternative to extruding a pressed tantalum powder. one skilled in the art would have

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